High Speed, Low Power Wide Supply Range Amplifier

AD817

FEATURES

Low Cost
High Speed
- **50 MHz Unity Gain Bandwidth**
- **350 V/μs Slew Rate**
- **45 ns Settling Time to 0.1% (10 V Step)**

Flexible Power Supply
- **Specified for Single (+5 V) and Dual (±5 V to ±15 V) Power Supplies**
- **Low Power: 7.5 mA max Supply Current**

High Output Drive Capability
- **Drives Unlimited Capacitive Load**
- **50 mA Minimum Output Current**

Excellent Video Performance
- **70 MHz 0.1 dB Bandwidth (Gain = +1)**
- **0.04% & 0.08° Differential Gain & Phase Errors @ 3.58 MHz**

Available in 8-Pin SOIC and 8-Pin Plastic Mini-DIP

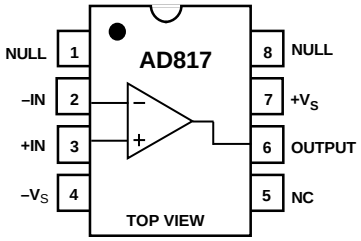
PRODUCT DESCRIPTION

The AD817 is a low cost, low power, single/dual supply, high speed op amp which is ideally suited for a broad spectrum of signal conditioning and data acquisition applications. This breakthrough product also features high output current drive capability and the ability to drive an unlimited capacitive load while still maintaining excellent signal integrity.

The 50 MHz unity gain bandwidth, 350 V/μs slew rate and settling time of 45 ns (0.1%) make possible the processing of high speed signals common to video and imaging systems. Furthermore, professional video performance is attained by offering differential gain & phase errors of 0.04% & 0.08° @ 3.58 MHz and 0.1 dB flatness to 70 MHz (gain = +1).

CONNECTION DIAGRAM

8-Pin Plastic Mini-DIP (N) and SOIC (R) Packages



NC = NO CONNECT

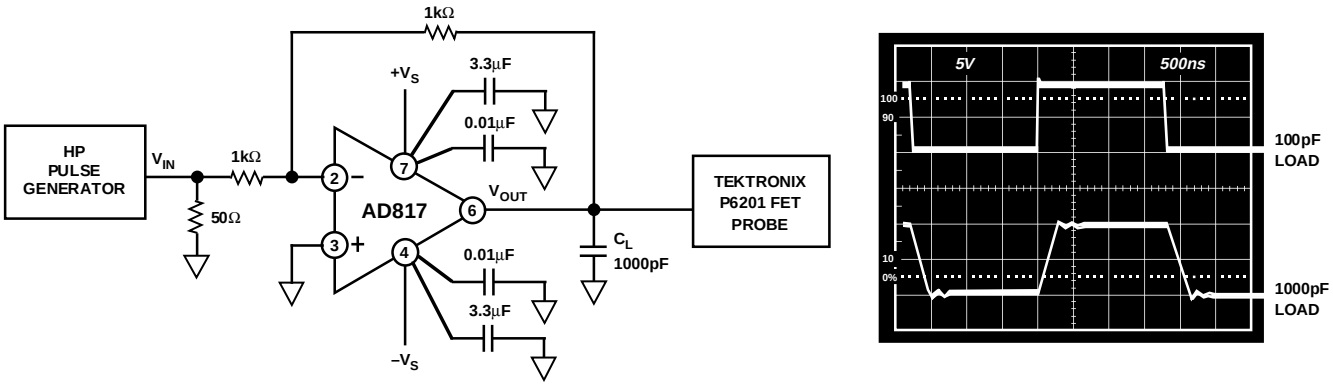
The AD817 is fully specified for operation with a single +5 V power supply and with dual supplies from ±5 V to ±15 V. This power supply flexibility, coupled with a very low supply current of 7.5 mA and excellent ac characteristics under all power supply conditions, make the AD817 the ideal choice for many demanding yet power sensitive applications.

In applications such as ADC buffers and line drivers the AD817 simplifies the design task with its unique combination of a 50 mA minimum output current and the ability to drive unlimited capacitive loads.

The AD817 is available in 8-pin plastic mini-DIP and SOIC packages.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
AD817AN	–40°C to +85°C	8-Pin Plastic DIP	N-8
AD817AR	–40°C to +85°C	8-Pin Plastic SOIC	R-8



AD817 Driving a Large Capacitive Load

AD817—SPECIFICATIONS (@ T_A = +25°C, unless otherwise noted)

Parameter	Conditions	V_S	AD817A Min	AD817A Typ	AD817A Max	Units
DYNAMIC PERFORMANCE						
Unity Gain Bandwidth		±5 V	30	35		MHz
		±15 V	45	50		MHz
		0, +5 V	25	29		MHz
Bandwidth for 0.1 dB Flatness	Gain = +1	±5 V	18	30		MHz
		±15 V	40	70		MHz
		0, +5 V	10	20		MHz
Full Power Bandwidth[1]	V_{OUT} = 5 V p-p					
	R_{LOAD} = 500 Ω	±5 V		15.9		MHz
	V_{OUT} = 20 V p-p					
	R_{LOAD} = 1 kΩ	±15 V		5.6		MHz
Slew Rate	R_{LOAD} = 1 kΩ	±5 V	200	250		V/µs
	Gain = 1	±15 V	300	350		V/µs
		0, +5 V	150	200		V/µs
Settling Time to 0.1%	–2.5 V to +2.5 V	±5 V		45		ns
	0 V–10 V Step, A_V = –1	±15 V		45		ns
to 0.01%	–2.5 V to +2.5 V	±5 V		70		ns
	0 V–10 V Step, A_V = –1	±15 V		70		ns
Total Harmonic Distortion	F_C = 1 MHz	±15 V		63		dB
Differential Gain Error	NTSC	±15 V		0.04	0.08	%
(R_{LOAD} = 150 Ω)	Gain = +2	±5 V		0.05	0.1	%
		0, +5 V		0.11		%
Differential Phase Error	NTSC	±15 V		0.08	0.1	Degrees
(R_{LOAD} = 150 Ω)	Gain = +2	±5 V		0.06	0.1	Degrees
		0, +5 V		0.14		Degrees
INPUT OFFSET VOLTAGE		±5 V to ±15 V		0.5	2	mV
	T_{MIN} to T_{MAX}				3	mV
Offset Drift				10		µV/°C
INPUT BIAS CURRENT		±5 V, ±15 V		3.3	6.6	µA
	T_{MIN}				10	µA
	T_{MAX}				4.4	µA
INPUT OFFSET CURRENT		±5 V, ±15 V		25	200	nA
	T_{MIN} to T_{MAX}				500	nA
Offset Current Drift				0.3		nA/°C
OPEN LOOP GAIN	V_{OUT} = ±2.5 V	±5 V				
	R_{LOAD} = 500 Ω		2	4		V/mV
	T_{MIN} to T_{MAX}		1.5			V/mV
	R_{LOAD} = 150 Ω		1.5	3		V/mV
	V_{OUT} = ±10 V	±15 V				
	R_{LOAD} = 1 kΩ		4	6		V/mV
	T_{MIN} to T_{MAX}		2.5	5		V/mV
	V_{OUT} = ±7.5 V	±15 V				
	R_{LOAD} = 150 Ω					
	(50 mA Output)		2	4		V/mV
COMMON-MODE REJECTION	V_{CM} = ±2.5 V	±5	78	100		dB
	V_{CM} = ±12 V	±15 V	86	120		dB
		±15 V	80	100		dB
POWER SUPPLY REJECTION	V_S = ±5 V to ±15 V		75	86		dB
	T_{MIN} to T_{MAX}		72			dB
INPUT VOLTAGE NOISE	f = 10 kHz	±5 V, ±15 V		15		nV/√Hz
INPUT CURRENT NOISE	f = 10 kHz	±5 V, ±15 V		1.5		pA/√Hz

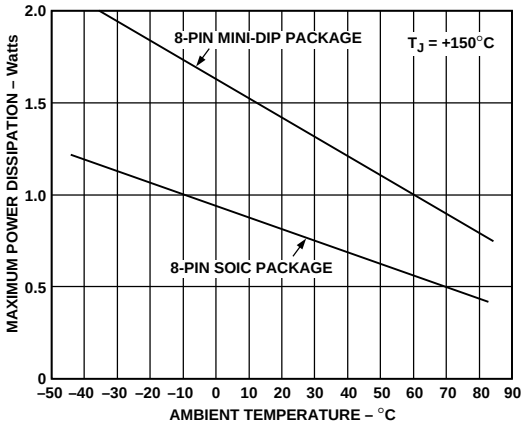
Parameter	Conditions	V_S	AD817A Min	Typ	Max	Units
INPUT COMMON-MODE VOLTAGE RANGE		±5 V	+3.8	+4.3		V
			–2.7	–3.4		V
		±15 V	+13	+14.3		V
			–12	–13.4		V
		0, +5 V	+3.8	+4.3		V
			+1.2	+0.9		V
OUTPUT VOLTAGE SWING	R_{LOAD} = 500 Ω	±5 V	3.3	3.8		±V
	R_{LOAD} = 150 Ω	±5 V	3.2	3.6		±V
	R_{LOAD} = 1 kΩ	±15 V	13.3	13.7		±V
	R_{LOAD} = 500 Ω	±15 V	12.8	13.4		±V
	R_{LOAD} = 500 Ω	0, +5 V	+1.5, +3.5			V
Output Current		±15 V	50			mA
		±5 V	50			mA
		0, +5 V	30			mA
Short-Circuit Current		±15 V		90		mA
INPUT RESISTANCE				300		kΩ
INPUT CAPACITANCE				1.5		pF
OUTPUT RESISTANCE	Open Loop			8		Ω
POWER SUPPLY						
Operating Range	Dual Supply		±2.5		±18	V
	Single Supply		+5		+36	V
Quiescent Current		±5 V		7.0	7.5	mA
	T_{MIN} to T_{MAX}	±5 V			7.5	mA
		±15 V			7.5	mA
	T_{MIN} to T_{MAX}	±15 V		7.0	7.5	mA

NOTES
[1]Full power bandwidth = slew rate/2 π V_{PEAK}.
Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS[1]

Supply Voltage . . . . . ±18 V
Internal Power Dissipation[2]
  Plastic (N) . . . . . See Derating Curves
  Small Outline (R) . . . . . See Derating Curves
Input Voltage (Common Mode) . . . . . $\pm V_S$
Differential Input Voltage . . . . . ±6 V
Output Short Circuit Duration . . . . . See Derating Curves
Storage Temperature Range N, R . . . . . –65°C to +125°C
Operating Temperature Range . . . . . –40°C to +85°C
Lead Temperature Range (Soldering 10 sec) . . . . . +300°C

NOTES
[1]Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
[2]Specification is for device in free air: 8-pin plastic package: θ_{JA} = 100°C/watt; 8-pin SOIC package: θ_{JA} = 160°C/watt.



Maximum Power Dissipation vs. Temperature

CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the AD817 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

HIGH SPEED DAC BUFFER

The wide bandwidth and fast settling time of the AD817 make it a very good output buffer for high speed current output D/A converters like the AD668. As shown in Figure 38, the op amp establishes a summing node at ground for the DAC output. The output voltage is determined by the amplifier's feedback resistor (10.24 V for a 1 kΩ resistor). Note that since the DAC generates a positive current to ground, the voltage at the amplifier output will be negative. A 100 Ω series resistor between the noninverting amplifier input and ground minimizes the offset effects of op amp input bias currents.

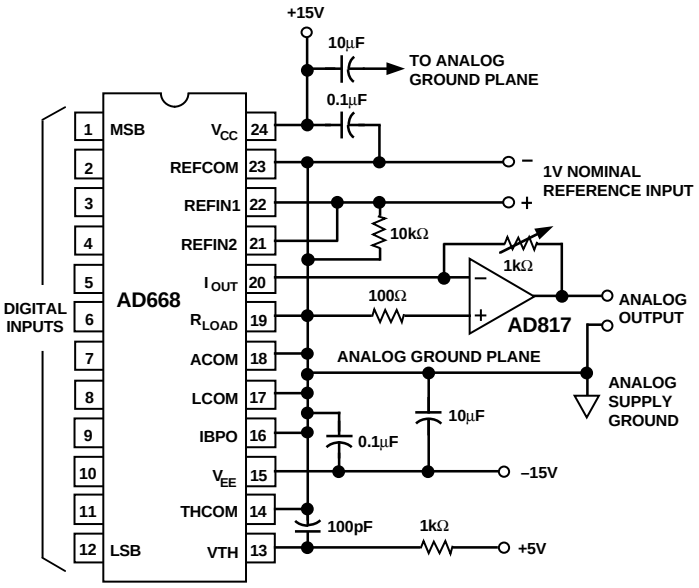
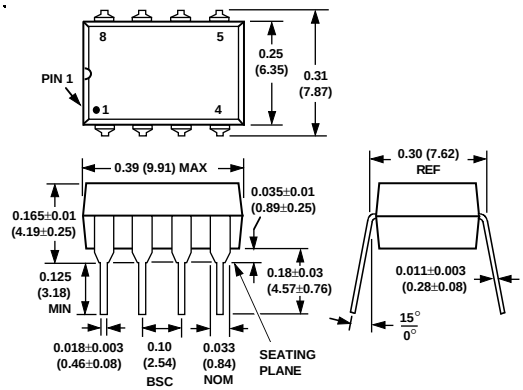


Figure 38. High Speed DAC Buffer

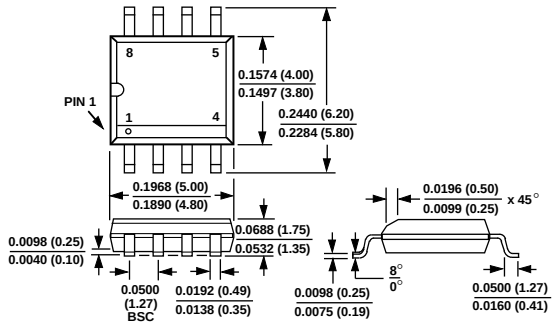
OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

8-Pin Plastic Mini-DIP (N-8)



8-Pin SOIC (SO-8)



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